Cost Effectiveness of Sending of Routine Collection of Sinus Contents in Skull-Base Patients

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Introduction

- Following endoscopic skull-base surgeries, it is common practice to send sinus contents for histopathological review and examination, in addition to the tumor/pathology itself.
- Histologic analysis of standard surgical specimens has long been thought to enhance diagnostic precision, ensure quality control, and offer procedural documentation.[1] However, with rising healthcare costs, the necessity of this practice has been challenged in specific situations, such as this one.[1]
- In this study, we sought to determine if the regular collection of sinus contents uncovers another disease process or informs clinical decision-making.
- We also determined the cost of routinely sending sinus contents to pathology for evaluation.
- We believe that there is no clinical benefit to sending sinus contents to pathology, and that it is not cost effective.

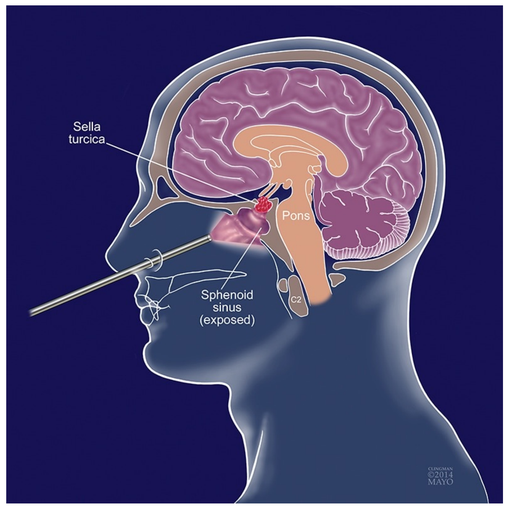

Figure 1. Endoscopic endonasal approach for pituitary surgery. Image source: Mayo Clinic. Published January 2016. Accessed January 19, 2025. https://www.mayoclinic.org/medical-professionals/endocrinology/news/advances-in-endoscopic-pituitary-surgery/mac-20429336.

Aims and Objectives

- This project will evaluate the use (or misuse) of resources as it pertains to sinus skull-based surgeries
- If successful in determining the ineffectiveness of the current proactive, this may yield a new standard protocol for skull-based surgeries, saving the hospital thousands of dollars and allowing physicians to make better use of their time.

Materials and Methods

- The authors conducted a retrospective cohort review of patients undergoing endoscopic endonasal transsphenoidal skull-base surgery performed by a single Otolaryngologist and Neurosurgeon at a tertiary referral center from 2017 to 2022 using data from the institution's electronic medical record.
- Data was organized by patient demographics (age, sex, race/ethnicity, BMI) as well as presenting symptoms, comorbidities, primary diagnosis, and pathology diagnosis
- We compared preoperative, postoperative, and histological diagnoses of each patient, excluding those for whom no sinus specimen was submitted for histologic examination.
- We determined if the sinus contents findings yielded any changes in diagnosis and/or altered treatment plans.
- Using a pie graph, we analyzed the cost to society of sending sinus contents to pathology.

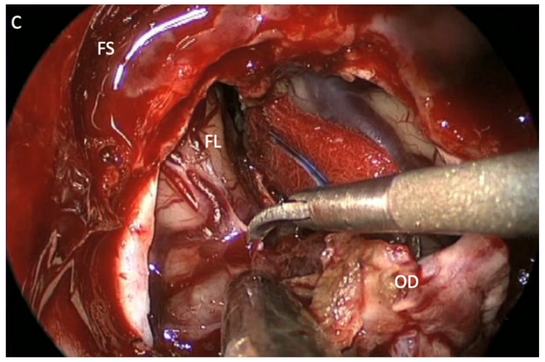

Figure 2. Intraoperative endoscopic endonasal view of dural dissection of Olfactory Neuroblastoma (ONB) using Endoscopic Endonasal Surgery (EES) techniques. FS: Frontal sinus; FL: frontal lobe; OD: olfactory dura; ONB: olfactory neuroblastoma; MRI: magnetic resonance imaging; EES: endoscopic endonasal surgery. Image source: Tang A, Adida S, Gardner PA. The role of endoscopic endonasal surgery in the management of sinonasal malignant tumors with skull base involvement. OAE Publishing. Published 2024. Accessed January 19, 2025. https://www.oaepublish.com/articles/2574-1225.2024.04.

Results

	Change from pre-op pathology dx? No: (N=205)	Yes: (N=3)	Total (N=208)
Age (years)			
N	205	3	208
Mean (SD)	54.3 (16.97)	49.7 (9.50)	54.2 (16.88)
Median (IQR)	56.0 (42.0, 68.0)	50.0 (40.0, 59.0)	56.0 (41.5, 67.5)
Range	7.0, 92.0	40.0, 59.0	7.0, 92.0
Gender, n (%)			
Female	105 (51.2%)	1 (33.3%)	106 (51.0%)
Male	100 (48.8%)	2 (66.7%)	102 (49.0%)
Ethnicity, n (%)			
White	117 (57.4%)	1 (33.3%)	118 (57.0%)
Black	56 (27.5%)	1 (33.3%)	57 (27.5%)
Hispanic	4 (2.0%)	0 (0.0%)	4 (1.9%)
Other	27 (13.2%)	1 (33.3%)	28 (13.5%)
Missing	1	0	1
BMI, n (%)			
Normal-18.5—24.9	35 (17.2%)	0 (0.0%)	35 (17.0%)
Overweight-25.0—29.9	62 (30.5%)	2 (66.7%)	64 (31.1%)
Obese: >30:	106 (52.2%)	1 (33.3%)	107 (51.9%)
Missing	2	0	2

Figure 3. Summary of patient demographics and changes in preoperative diagnosis following histopathology analysis of sinus contents from 208 skull-base surgeries (2017–2022).

- Of the 208 surgeries performed, only three had sinus contents that differed from the tumor
- One patient had Chronic Lymphocytic Leukemia (CLL) found in the sinus contents that was not found in the original tumor. The patient was male, white race, BMI 25 - 30, age 59 with no significant PMH who presented with a headache.
- However, this did not change the patient's treatment, as CLL is watched chronically.
- For two other patients, they were found to have fungal mycetomas in their sinus contents and not in their tumor pathology.
- One of these patients was a male, "other" race, with a PMH of Obesity (BMI > 30) and Diabetes, age 40, who presented with abdominal pain, nausea and vomiting. Second case was a female, black race, BMI between 25 - 30, age 50, with a PMH of hay fever and nasal polyps, presented with left-sided nasal obstruction.
- However, the treatment for fungal mycetomas is skull base surgery itself, so these findings also did not alter clinical treatment
- It is hard to find a common trait in these three cases, as they all have a different race, presenting symptoms, and age. Two were male, and two had similar BMIs.

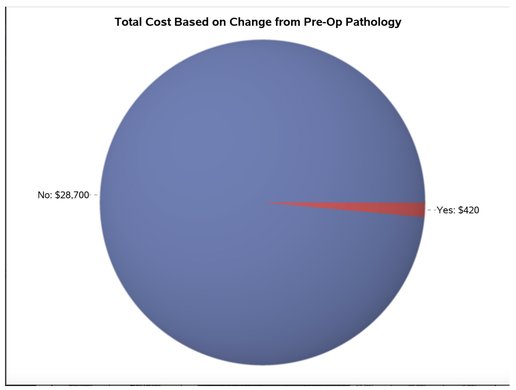

Figure 4. Comparison of total costs for histopathological review of sinus contents versus costs associated with cases that resulted in a change in diagnosis. Data highlights the financial efficiency of histopathological analysis in altering clinical decision-making.

- The cost of sending sinus contents to pathology is roughly $140 per patient
- Of the 208 skull-base cases, $28,700 was spent, with only $420 of that total yielding any change in diagnosis
- Unfortunately, none of the $28,700 impacted patient treatment.

Conclusions

- The economic evaluation strongly opposes the current practice of sending sinus contents to pathology in skull-base cases.
- The regular collection of sinus contents rarely uncovers another disease process and does not alter clinical decision making
- Furthermore, there are no considerable benefits to the current practice, and it should therefore be stopped.

References

1. Lin MM, Goldsmith JD, Resch SC, DeAngelis JP, Ramappa AJ. Histologic examinations of arthroplasty specimens are not cost-effective: a retrospective cohort study. *Clin Orthop Relat Res.* 2012;470(1):145-150. doi:10.1007/s11999-011-2104-2

2. Mayo Clinic. Endoscopic endonasal approach. *Mayo Clinic.* Published January 2016. Accessed January 19, 2025. https://www.mayoclinic.org/medical-professionals/endocrinology/news/advances-in-endoscopic-pituitary-surgery/mac-20429336

3. Tang A, Adida S, Gardner PA. The role of endoscopic endonasal surgery in the management of sinonasal malignant tumors with skull base involvement. *OAE Publishing.* Published 2024. Accessed January 19, 2025. https://www.oaepublish.com/articles/2574-1225.2024.04

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